

MICROWAVE ASSISTED EXTRACTION (MAE) OF
BETA-SITOSTEROL FROM PLANT LEGUMES POD

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I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Archidendron pauciflorum atau jering, petai atau *Parkia speciosa* dan *Leucaena leucocephala* atau petai belalang diketahui sebarang santapan tempatan di banyak negara asi dan mempunyai banyak kebaikan kepada kesihatan seperti sebagai antimikrobial, antioksidan, hipoglisemia, antiulser dan anti-hypertensi. Kajian semasa pada masa kini hanya menunjukkan kewujudan phytosteroid didalam tumbuhan tetapi tidak pada konsentrasinya. Proses pengekstrakan beta-sitosterol dilakukan dengan menggunakan proses ekstraksi bantuan-mikrowave. Selepas proses pengekstrakan, proses pencirian dilakukan dengan menggunakan spektroskopi ultraviolet (UV-Vis), fourier transform inframerah (FTIR), analisis kromatografi cecair prestasi tinggi (HPLC) dan mikroskop elektron pengimbasan (SEM). Analisis UV-Vis menganalisis konsentrasi kandungan beta-sitosterol dalam polong kacang manakala ftir akan memberi kumpulan berfungsi pod legum. Sem menunjukkan keadaan permukaan tumbuhan sebelum dan selepas proses pengekstrakan dan untuk memastikan proses pengekstrakan pada keadaan parameter yang diingini. Untuk mengoptimumkan pengeluaran maksimum beta-sitosterol, parameter pengekstrakan telah dioptimumkan dengan menggunakan kaedah permukaan tindak balas (rsm) dengan menggunakan Design Expert 7.0. Proses pengoptimuman dilakukan dengan menggunakan satu faktor pada satu masa (OFAT) untuk proses penyaringan di mana penyelidikan akan diteruskan dengan polong kacang yang kandungan dengan hasil tertinggi beta-sitosterol, reka bentuk faktorial fraksional (FFD) untuk menyaring parameter proses pengekstrakan dan reka bentuk komposit pusat (CCD) untuk pengoptimuman proses pengekstrakan akan diperlukan untuk merancang dan menyiasat proses yang paling diperlukan. Proses ofat dilakukan dengan menggunakan empat parameter, iaitu tempoh pengekstrakan, daya radiasi, konsentrasi pelarut dan suhu pengekstrakan dengan ketiga-tiga jenis tumbuhan. Dari hasil kajian OFAT, FFD diteruskan dengan tempoh pengekstrakan dan konsentrasi pelarut dengan hanya *l. Leucocephala* legume. Keputusan CCD dioptimumkan dengan pelarut etanol 62.5%, masa pengekstrakan sebanyak 7.45 min, kuasa radiasi 600W dan suhu penyinaran 75°C untuk menghasilkan beta-sitosterol tertinggi iaitu 0.31 mg / mL.

ABSTRACT

Archidendron pauciflorum or Jering, Petai or *Parkia speciosa*, and *Leucaena leucocephala* or Petai Belalang are all known as a local delicacy to many countries in Asia and yet also have the beneficial aspect in health such as an antimicrobial, antioxidant, hypoglycaemic, antiulcer and anti-hypertension. Present studies only shows on the present of phytosteroid in the plant but not its concentration. The extraction process of beta-sitosterol performed by using Microwave-Assisted Extraction process. After the extraction process, the characterization process was done by using ultraviolet-visible spectroscopy (UV-VIS), Fourier transform infrared (FTIR), high-performance liquid chromatographic analysis (HPLC) and scanning electron microscope (SEM). UV-Vis analysis analyse concentration of beta-sitosterol content in the legume pod while the FTIR will give the functional group of the legume pod. SEM shows the condition of plant surface before and after the extraction process and to ensure the extraction process at desired parameter condition. In order to optimize the maximum yield extraction of beta-sitosterol, the extraction parameter was optimize by using response surface method (RSM) by using Design Expert 7.0. The optimization process was done by using one factor at a time (OFAT) for the screening process where the research will be continued with legume pod that content with the highest yield of beta-sitosterol, fractional factorial design (FFD) for screening extraction process parameter and central composite design (CCD) for the optimization of the extraction process will be required in order to plan and investigate the most required processes. OFAT process was done by using four parameters, which are extraction duration, irradiation power, solvent concentration and extraction temperature with all three types of plant. From OFAT study result, FFD was continued with time and solvent concentration with only *L. leucocephala* legume. CCD result was optimized with 62.5% ethanol solvent, 7.45 min of extraction duration, 600W irradiation power and 75°C irradiation temperature to give the highest yield of beta-sitosterol which is 0.31 mg/mL.

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LIST OF ABBREVIATIONS

<i>A.jiringa</i>	<i>Archidendron jiringa</i>
ANOVA	Analysis of variance
CCD	Central Composite Demand
COD	Chemical Oxygen Demand
FFD	Fractional Factorial Design
FTIR	Fourier Transform Infrared
HPLC	High Performance Liquid Chromatography
<i>L.leucocephala</i>	<i>Leucaena leucocephala</i>
MAH	Microwave Assisted Hydrodistillation
OFAT	One Factor One Time
<i>P. speciosa</i>	<i>Parkia speciosa</i>
RSM	Response Surface Methodology
SEM	Scanning Electron Microscopy
UV-Vis	Ultra Violet Visible Spectroscopy

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